AMENDMENTS TO THE CLAIMS

Please amend claims 1, 2, 3, 7, 8, 12, 19, and 20, and add new claims 23-44 as follows:

1. (AMENDED) An optical disc apparatus comprising:

a converging section for converging a light beam and irradiating a rotating information medium with the converged light beam;

a moving section for moving the converging section, thereby moving a converging point of the converged light beam in a direction perpendicular to an information surface of the information medium;

a converging state detection section for generating a focus servo signal which represents a converging state of the light beam on the information medium based on reflected light or transmitted light of the light beam from the information medium;

a focus servo control section for controlling the moving section based on the focus servo signal, so that the light beam reaches a predetermined converging state on the information medium; and

a focus pull-in section for turning ON the control by the focus servo control section,

wherein the focus pull-in section turns ON the control by the focus servo control section in a case where the focus pull-in section determines that the converging point of the light beam is located in the vicinity of the position where the velocity of the information medium axial deviation is minimum [the vicinity of the minimum velocity position on the information medium axial deviation].

2. (AMENDED) An optical disc apparatus according to claim 1, further comprising an S-shape signal detection section for detecting S-shape signals which appear in the focus servo signal when the converging point of the light beam contacts the information surface of the information medium,

wherein the focus pull-in section determines whether or not the converging point of the light beam is located in the vicinity of the position where the velocity of the information medium axial deviation is minimum [the vicinity of the minimum velocity position on the information medium axial deviation].

3. (AMENDED) An optical disc apparatus according to claim 2, further comprising a detected interval measuring section for measuring an interval between temporally adjoining two of the S-shape signals,

wherein the focus pull-in section determines that the converging point of the light beam is located in the vicinity of the position where the velocity of the information medium axial deviation is minimum [the vicinity of the minimum velocity position on the information medium axial deviation] when the interval exceeds a predetermined first period of time.

8. (AMENDED) An optical disc apparatus according to claim 2, further comprising a time width measuring section for measuring a time width of a predetermined portion of an S-signal,

wherein the focus pull-in section determines that the converging point of the light beam is located in the vicinity of the position where the velocity of the information medium axial deviation is minimum [the vicinity of the minimum velocity position on the information medium axial deviation] when the interval exceeds a predetermined second period of time.

12. (AMENDED) An optical disc apparatus according to claim 9, wherein the S-shape signal detection section detects the S-shape signals by making the converging point of the light beam wait at a predetermined position in the case where the interval is not output from the detected interval measuring section after the elapse of the time required for one revolution of the information medium after the time when one of the S-signals was detected, or the elapse of the first period of time which is slightly shorter than the time required for one revolution of the information medium.

18. (AMENDED) An optical disc apparatus according to claim 2, further comprising [a] an information medium identification section for identifying the type of the information medium by a signal based on reflecting light or transmitting light from the information medium,

wherein the focus pull-in section determines a moving speed or a waiting position of the converging point of the light beam when the focus pull-in section moves the converging point of the light beam toward or away from the information surface of the information medium, or makes the converging point of the light beam wait at a predetermined position.

19. (AMENDED) An optical disc apparatus according to claim 18, wherein the conversion point of the light beam, moving toward the information surface of the information medium, is kept at a predetermined driving value based on [the detection result] of the type of the information medium, whereby the conversion point of the light beam is kept from approaching unnecessarily close to the information medium.

20. (AMENDED) An optical disc apparatus according to claim 1, further comprising a lower limit detection section for detecting the lower limit of an output signal of the focus servo control section or an input signal thereof during the operation of the focus servo control section, and a lower limit storing section for storing the detected lower limit,

wherein, in the case where the focus servo control is OFF: if the converging point of the light beam contacts on the vicinity of the position at where the velocity of the information medium axial deviation is minimum when the output signal of the drive signal reaches the lower limit by moving the conversion point of the light beam toward the information surface of the information medium, the focus pull-in section performs an operation to start the control by the focus servo control section [in the case where the focus servo control section is restarted after the focus servo control section if OFF: it is determined that the converging point of the light beam is in the vicinity of the minimum velocity position on the information medium axial deviation when

the conversing point of the light beam contacts on the information surface of the information medium until the output signal or the drive signal reaches the lower limit by driving the moving section; and the focus pull-in section performs a retry operation which restarts the control by the focus servo control section when it is determined that the level of the focus servo signal reaches a predetermined pull-in level].

23. (NEW) A digital signal processor for controlling the focus servo of an optical disk apparatus,

the optical disk apparatus including;

a converging section for converging a light beam and irradiating a rotating information medium with the converged light beam;

a moving section for converging a light beam and irradiating a rotating information medium with the converged light beam; and

a converging state detection section for generating a focus servo signal which represents a converging state of the light beam on the information medium based on reflected light or transmitted light of the light beam from the information medium,

the digital signal processor having an input coupled to the focus servo signal comprising:

a focus servo control section for controlling the converging section based on the focus servo signal, so that the light beam reaches a predetermined converging state on the information medium; and

a focus pull-in section for turning ON the control by the focus servo control section in a case where the focus pull-in section determines that the converging point of the light beam is located in the vicinity of the position where the velocity of the information medium axial deviation is minimum.

24. (NEW) A digital signal processor according to claim 23, further comprising an S-shape signal detection section for detecting S-shape signals which appear in the focus servo signal when the converging point of the light beam contacts the information surface of the information medium,

wherein the focus pull-in section determines whether or not the converging point of the light beam is located in the vicinity of the position where the velocity of the information medium axial deviation is minimum.

25. (NEW) A digital signal processor according to claim 24, further comprising a detected interval measuring section for measuring an interval between temporally adjoining two of the S-shape signals,

wherein the focus pull-in section determines that the converging point of the light beam is located in the vicinity of the position where the velocity of the information medium axial deviation is minimum when the interval exceeds a predetermined first period of time.

26. (NEW) A digital signal processor according to claim 25, wherein the S-shape signal detection section detects the S-shape signals by either moving the converging point of the light beam toward or away from the information surface of the information medium, or making the converging point of the light beam wait at a predetermined position.

27. (NEW) A digital signal processor according to claim 26, wherein the S-shape signal detection section detects the S-shape signals by retrying to move the converging point of the light beam toward the information surface of the information medium at a predetermined speed, in the case where the interval is not output from the detected interval measuring section after the elapse of time required for one revolution of the information medium.

28. (NEW) A digital signal processor according to claim 27, wherein the focus pull-in section sets the retry speed of the converging point of the light beam so as to be smaller than a speed of the previous motion toward or away from the information surface of the information medium.

29. (NEW) A digital signal processor according to claim 26, wherein the S-shape signals are detected by making the converging point of the light beam wait at a predetermined position in the case where the interval is not output from the detected interval measuring section after the elapse of the first period of time.

30. (NEW) A digital signal processor according to claim 24, further comprising a time width measuring section for measuring a time width of a predetermined portion of an S-signal,

wherein the focus pull-in section determines that the converging point of the light beam is located in the vicinity of the position where the velocity of the information medium axial deviation is minimum when the interval exceeds a predetermined second period of time.

31. (NEW) A digital signal processor according to claim 30, wherein the S-shape signal detection section detects the S-shape signal by either moving the converging point of the light beam toward or away from the information surfaces of the information medium, or making the converging point of the light beam wait at an predetermined position.

32. (NEW) A digital signal processor according to claim 31, wherein the S-shape signal detection section detects the S-shape signals by retrying to move the converging point of the light beam toward the information surface of the information medium at a predetermined speed, in the case where the interval is not output from the detected interval measuring section after the elapse of time required for one revolution of the information medium.

33. (NEW) A digital signal processor according to claim 32, wherein the focus pull-in section sets the retry speed of the converging point of the light beam so as to be smaller than a speed of the previous motion toward or away from the information surface of the information medium.

34. (NEW) A digital signal processor according to claim 31, wherein the S-shape signal detection section detects the S-shape signals by making the converging point of the light beam wait at a predetermined position in the case where the interval is not output from the detected interval measuring section after the elapse of the time required for one revolution of the information medium after the time when one of the S-signals was detected, or the elapse of the first period of time which is slightly shorter than the time required for one revolution of the information medium.

35. (NEW) A digital signal processor according to claim 23, wherein the focus pull-in section turns ON the control by the focus servo control section when it is detected that the level of the focus servo control section reaches a predetermined pull-in level.

36. (NEW) A digital signal processor according to claim 26, wherein the focus pull-in section further comprises a moving speed switching section for switching the moving speed of the converging point of the light beam in response to the polarity of the S-signals when the focus pull-in section moves the converging point of the light beam toward or away from the information surface of the information medium.

37. (NEW) A digital signal processor according to claim 32, wherein the focus pull-in section further comprises a moving speed switching section for switching the moving speed of the converging point of the light beam in response to the polarity of the S-signals when the focus pull-in section moves the converging point of the light beam toward or away from the information surface of the information medium.

38. (NEW) A digital signal processor according to claim 26, further comprising a rotation speed measurement section for measuring the rotation speed of the information medium,

wherein the focus pull-in section sets the first period of time or the predetermined speed based on the rotation speed measured by the rotation speed measurement section.

39. (NEW) A digital signal processor according to claim 31, further comprising a rotation speed measurement section for measuring the rotation speed of the information medium,

wherein the focus pull-in section sets the second period of time or the predetermined speed based on the rotation speed measured by the rotation speed measurement section.

40. (NEW) A digital signal processor according to claim 24, further comprising an information medium identification section for identifying the type of the information medium by a signal based on reflecting light or transmitting light from the information medium,

wherein the focus pull-in section determines a moving speed or a waiting position of the converging point of the light beam when the light beam toward or away from the information surface of the information medium, or makes the converging point of the light beam wait at a predetermined position.

41. (NEW) A digital signal processor according to claim 40, wherein the focus pull-in section keeps the conversion point of the light beam, moving toward the information surface of the information medium, at a predetermined driving value based on the type of the information medium, whereby the conversion point of the light beam is kept from approaching unnecessarily close to the information medium.

42. (NEW) A digital signal processor according to claim 23, further comprising a lower limit detection section for detecting the lower limit of an output signal of the focus servo control section or an input signal thereof during the operation of the focus servo control section, and a lower limit storing section for storing the detected lower limit,

wherein, in the case where the focus servo control is OFF: if the converging point of the light beam contacts on the vicinity of the position at where the velocity of the information medium axial deviation is minimum when the output signal or the drive signal reaches the lower limit by moving the conversion point of the light beam toward

the information surface of the information medium, the focus pull-in section performs an operation to start the control by the focus servo control section.

43. (NEW) A digital signal processor according to claim 42, wherein the lower limit which corresponds to more than one location located in the radius direction of the information medium, and the digital signal processor further comprises a calculation section for calculating the lower limit corresponding to a predetermined location in a radius direction of the information medium based on the at least one lower limit.

44. (NEW) A digital signal processor according to claim 42, wherein the lower limit detection section operates during the operation of the focus servo control section, whereby the stored value of the lower limit storing section is continuously updated.